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ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

HIGHLIGHTS



NORTH ATLANTIC TREATY ORGANIZATION



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Contents :

FOREWORD	3	<i>Jack Burnham</i>
VON KARMAN MEDAL 1979	5	
AGARD'S ROLE IN NATO	6	<i>Dr Robert H. Korkegi</i>
CHAIRMAN CHANGE	8	
AGARD MEETINGS 1980	9	
PARIS PANORAMA	14	

6
AGARD Highlights.

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THE MISSION OF AGARD

The mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

- Exchanging of scientific and technical information;
- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;
- Improving the co-operation among member nations in aerospace research and development;
- Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;
- Providing assistance to member nations for the purpose of increasing their scientific and technical potential;
- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

The highest authority within AGARD is the National Delegates Board consisting of officially appointed senior representatives from each member nation. The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Programme and the Aerospace Applications Studies Programme. The results of AGARD work are reported to the member nations and the NATO Authorities through the AGARD series of publications of which this is one.

Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations.

Published September 1979

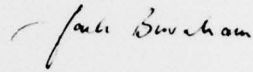
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Foreword

My time so far at AGARD has been brief and it seems fitting that this foreword to AGARD Highlights should be brief also. I have found in AGARD Headquarters a keen, enthusiastic and high-quality staff and look forward to working with them and with the wider AGARD Community towards the fulfilment of the AGARD Mission.

A handwritten signature in cursive script, reading "Jack Burnham".

Jack Burnham
Director, AGARD

All members of AGARD, whether National Delegates, Panel Members or AGARD Staff, are cordially invited to submit articles likely to be of interest to other AGARD members for the next issue of AGARD HIGHLIGHTS which will appear in the Spring of 1980. Articles should be addressed to:

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AGARD-NATO
7, rue Ancelle
92200 Neuilly sur Seine
France

or, from US and Canada only:

AGARD-NATO
APO New York 09777

Front cover:

FLORENCE, ITALY

Looking down the river Arno with the Ponte S Trinita in the foreground and the well-known Ponte Vecchio behind: to the left can be seen the tower of the Palazzo della Signoria. Florence is the meeting place for the 47th AGARD National Delegates Board Meeting in September 1979.

Photo: Courtesy of the Italian National Tourist Office

Von Kármán Medal 1979

The Von Karman Medal for 1979 has been awarded to Professor Alec Young (United Kingdom) of the Department of Aeronautical Engineering at Queen Mary College, London. The formal presentation will take place at the Fall 1979 meeting of the AGARD National Delegates Board, in Florence. The citation which accompanies the medal reads as follows:



For many years Professor Young has been one of Europe's leading aerodynamicists. His contribution to fluid dynamics is recognized as being outstanding, both in theoretical and experimental research leading to aircraft and weapons design and development. As a professor and researcher he has established close links with many European and American universities which have contributed to the progress in their common research. As a member of the international group who set up the Von Karman Institute (known at that time as the Training Center for Experimental Aerodynamics) he participated actively in the Institute's programme. After the death of Dr von Karman in 1963 he was nominated Chairman of the Board of the VKI, and still holds this position. Professor Young has also played an active part in AGARD affairs since 1965 and has been one of the most active members of its Fluid Dynamics Panel. As Chairman of the Panel's Publications Committee since its inception, he has been largely responsible for the high quality of the publications selected by the Panel. As a member of many programme committees he has also chaired some important FDP symposia and short courses. Professor Young's continuous positive contribution to fluid dynamics in general, and the FDP in particular, has done much to draw attention to important scientific problem areas.

AGARD's Role in NATO

by
Robert H. Korkegi, Director AGARD (1976-79)

(The article below first appeared in the NATO Review, Volume 27, Number 3, (June, 1979) published by the NATO Information Service, Brussels, Belgium.)

AGARD, the Advisory Group for Aerospace Research and Development, has served NATO for over one-quarter of a century. Formed in 1952, it is the oldest scientific/technical organization in the Alliance, preceding the birth of the Science Committee, the SHAPE Technical Centre, the SACLANC Centre, and the Defence Research Group. Its Headquarters is located in Neuilly-sur-Seine, on the western outskirts of Paris, just north of the Bois de Boulogne. AGARD's founder and first Chairman, the late Professor Theodore von Kármán, was not only an eminent scientist of world renown, but also a true internationalist who championed the cause of scientific co-operation across national boundaries.¹

AGARD's role is broadly to stimulate and promote advances in the aerospace sciences in the interest of the common defence of the North Atlantic Alliance, and to encourage exchanges of technical information among the member countries. Not the least of its aims is to assist any nation of the Alliance which wants to increase its scientific and technical potential. Also of importance, AGARD provides advice and assistance in the field of aerospace research and development to NATO's Military Committee as well as to other NATO bodies upon their request.

In its early days, the European nations of the Alliance were just emerging from the ravages of World War II. AGARD played then a vital role in stimulating a resurgence of aeronautical research, and the launching of scientific activities related to high speed flight in such subjects as combustion and propulsion, test facilities for aerodynamic research, effects of high temperatures on

aircraft structures, and eventually, the frontiers of the atmosphere and beyond, into space. AGARD was therefore an active participant and coordinating element among the nations in the explosive developments in the aerospace sciences during the late 1950's and the 1960's that led to supersonic and hypersonic flight and then to lunar and space exploration.

Today's Environment

Today, with a highly competitive aerospace industry in Western Europe as well as in North America, with the emergence of several aerospace-related international scientific organizations, with sophisticated communications systems that provide the almost instantaneous transfer of masses of information, one may ask what is AGARD's present role in NATO.

In fact, the interest in AGARD being shown by the nations and by the NATO Military Authorities has never been greater. From the standpoint of the nations, the high cost of present-day aircraft coupled with tighter aerospace research and development budgets, points to perhaps an even greater need than ever before to pool know-how and resources and to engage in international collaborative efforts. But the emphasis which, several years ago, was on fundamental scientific studies in the aerospace disciplines, has shifted to more applied research areas.

AGARD has proved to be a flexible organization, adaptable to changing times. While the backbone of AGARD continues to be its nine technical Panels which deal with basic to applied research in their fields of specialty, new systems-oriented activities which cross the boundaries of technical disciplines provide today a more direct responsiveness to the immediate needs of the Alliance. The Aerospace Applications Studies Committee, which was created in 1971, can be viewed

¹ A fuller account of the beginning of AGARD can be found in "AGARD - The Early Days", E.L. Wattendorf, NATO's Fifteen Nations, December 1972, January 1973; and "The AGARD History 1952-1975", Technical Editing and Reproduction Ltd., London, 1976.

Prior to serving as Director of AGARD, Dr Korkegi had a long association with NATO. He was a Scientific Consultant to AGARD in 1956, Technical Director of the Von Kármán Institute for Fluid Dynamics in Brussels from 1957 to 1964, a member of a NATO Science Committee Ad Hoc Study Group in 1965-1966, and a long-time member of one of AGARD's technical panels. From 1964 to 1975 he served as Director of a US Air Force Research Laboratory. Dr Korkegi is now a Visiting Professor in the School of Engineering and Applied Science, George Washington University, Washington, DC.





AGARD NATIONAL DELEGATES BOARD in session at its Spring Meeting in Paris, March 1979.

as a complement to the Panels by bridging the gap between emerging technologies and military applications. The results of several of its studies have contributed directly to Task Force 5 on Air Defence as part of the Long Term Defence Programme of the Alliance.²

During the past two years, AGARD, at the request of the Military Committee, has been deeply engaged in an assessment of potential fundamental technological developments in aerospace up to the turn of the century and their possible impact on military applications. This study, known as Project 2000, is much more than a technological forecasting exercise. Through a mix of technologists and military operational experts working together in mission-oriented study groups, its objective is to supply aerospace development options to NATO's military authorities. Member nations have keenly responded to the needs for expertise and resources in support of Project 2000.

Another important aspect of AGARD's present activities is an effort to assist those NATO nations intent on improving their technological capabilities, by means of a high level tutorial programme of lecture series on subjects of current aerospace interest, and through missions of expert consultants covering the spectrum from technical management to specific technical disciplines.

Some Facts About AGARD

Although AGARD's full-time staff at its headquarters in Neuilly-sur-Seine numbers just over forty people, its permanent technical Panels are made up of some four hundred experts from the NATO nations, and over four thousand scientists and engineers participate in AGARD activities each year. AGARD organizes about forty meetings a year in the NATO countries, including symposia, specialists' meetings, and lecture series, as well as

a consultant and exchange programme and the activities of some twenty working groups which cover the spectrum from applied to mission-oriented studies.

In terms of cost effectiveness, the most important factor to remember is that, while NATO funds the operation of AGARD Headquarters, by far the major portion of AGARD's activities are financed directly by the individual nations.

The size of AGARD's programme can, in part, be gauged by the number of publications it produces, amounting to around a hundred each year, which makes it one of the largest publishers of technical literature in the Western world. In addition, the totality of these publications is widely regarded as constituting an outstanding library of aerospace literature.

Approval of AGARD's programme and appointments to its Panels, Committees, and Working Groups, are made by its governing body, the National Delegates Board, whose members are leading personalities in aerospace research and development from the NATO nations. Since Professor von Kármán died in 1963, the National Delegates Board has been chaired in succession by Professor C.D.Perkins of the United States, Mr F.Lied of Norway, Dr T.Benecke of the Federal Republic of Germany, Dr A.H.Flax of the United States, and Mr F.R.Thurston of Canada. The current Chairman is Dr A.M.Lovell, Deputy Administrator of the US National Aeronautics and Space Administration.

Thus it can be seen that while AGARD performed a vital role in promoting and stimulating the resurgence of scientific activity throughout the NATO countries in the early years following World War II, it is now fulfilling a broader function, covering the spectrum from fundamental and applied aerospace sciences to systems and mission-oriented studies. The latter studies are needed for more immediate defence planning purposes; the former are essential to nurture creative thinking and assure for the Alliance a sharp scientific edge in the interest of its long-term future.

² See "NATO's Long Term Defence Programme - Military Perspective", General H.F.Zeiner Gundersen, NATO Review No.3 (June) 1978.

CHAIRMAN CHANGE

*DR ALAN LOVELACE
(United States) taking over
from outgoing Chairman
Frank Thurston (Canada) at
the end of the National
Delegates Board Meeting in
Paris, March 1979.*



*PROFESSOR HAUS
(Belgium) presenting,
on behalf of his
colleagues on the
National Delegates
Board, a silver salver to
retiring Chairman Frank
Thurston "in
recognition of
outstanding leadership"
during his two-year
period of office.*

**CALENDAR OF PLANNED MEETINGS
1980**

<i>Tentative Dates</i>	<i>Location</i>	<i>Panel</i>	<i>Type of Meeting/Subject</i>
19-21 March	FRANCE (Paris)	Headquarters	48th National Delegates Board Meeting 28th Panel Chairmen Meeting 10th National Coordinators Meeting 29th Steering Committee Meeting
27-28 March	PORTUGAL (Lisbon)	Structures & Materials	Lecture Series No.106 Materials Coating Techniques
31 March - 1 April	GREECE (Athens)	Structures & Materials	Lecture Series No.106 Materials Coating Techniques
3-4 April	TURKEY (Ankara)	Structures & Materials	Lecture Series No.106 Materials Coating Techniques
13-18 April	GREECE (Athens)	Structures & Materials	50th Panel Meeting/Specialists' Meeting Effect of Service Environment on Composite Materials
5-9 May	GERMANY (Neubiberg)	Fluid Dynamics	46th Panel Meeting/Symposium on Subsonic-Transonic Configuration Aerodynamics
5-9 May	UNITED STATES (Eglin AFB, Fa)	Guidance & Control	30th Panel Meeting/Symposium on Guidance and Control Aspects of Tactical Air-Launched Missiles (NATO-Secret)
5-9 May	BELGIUM (Brussels)	Propulsion & Energetics	55th Panel Meeting/Specialists' Meeting on a) Testing and Measurement Techniques in Heat Transfer and Combustion b) Centrifugal Compressors
12-16 May	UNITED KINGDOM (London)	Electromagnetic Wave Propagation	Symposium on Propagation Effects in Space Earth Paths
12-13 May	FRANCE/GERMANY (St Louis)	Propulsion & Energetics	Lecture Series No.107 The Application of Design to Cost and Life Cycle Cost to Aircraft Engines
15-16 May	UNITED KINGDOM (London)	Propulsion & Energetics	Lecture Series No.107 The Application of Design to Cost and Life Cycle Cost to Aircraft Engines
19-21 May	FRANCE (Paris)	Aerospace Applications Studies Committee	Meeting No.18 - Refining of Final Terms of Reference for AAS 13, 14 & 15 - Organization of Working Group for AAS 13 - Initial Review for Study Group 12
19-23 May	NETHERLANDS (Amsterdam)	Flight Mechanics	56th Panel Meeting/Symposium on Design to Cost and Life Cycle Cost
19-23 May	NORWAY (Bodø)	Aerospace Medical	Specialists' Meeting on a) Aircrew Safety and Survivability b) Disorientation in Flight
19-23 May	BELGIUM (VKI, Brussels)	Fluid Dynamics	Lecture Series No.111 Cryogenic Wind Tunnels
27-29 May	UNITED STATES (NASA, Langley)	Fluid Dynamics	Lecture Series No.111 Cryogenic Wind Tunnels

<i>Tentative Dates</i>	<i>Location</i>	<i>Panel</i>	<i>Type of Meeting/Subject</i>
5-6 June	NORWAY (Stanern)	Flight Mechanics	Lecture Series No.108 Aircraft Assessment and Acceptance Testing
9-10 June	GREECE (Athens)	Flight Mechanics	Lecture Series No.108 Aircraft Assessment and Acceptance Testing
9-10 June	UNITED KINGDOM (London)	Avionics	Lecture Series No.110 Atmospheric Electricity/Aircraft Interaction
12-13 June	GERMANY (Munich)	Avionics	Lecture Series No.110 Atmospheric Electricity/Aircraft Interaction
12-13 June	TURKEY (Ankara)	Flight Mechanics	Lecture Series No.108 Aircraft Assessment and Acceptance Testing
16-20 June	PORTUGAL (Lisbon)	Avionics	39th Panel Meeting/Specialists' Meeting on Electromagnetic Effects of Carbon Composite Materials upon Avionics Systems
24-25 June	UNITED STATES (Palo Alto, Ca)	Avionics	Lecture Series No.110 Atmospheric Electricity/Aircraft Interaction
8-12 September	DENMARK (Copenhagen)	Avionics	40th Panel Meeting/Symposium on Image and Sensor Data Processing for Target Acquisition and Recognition (NATO-Secret)
15-19 September	CANADA (Toronto)	Aerospace Medical	37th Panel Meeting/Specialists' Meeting on a) Long-Term Therapeutics and Prophylactic Measures for Aircrew b) Toxic Hazards in Aviation
14-19 September	FRANCE (Aix en Provence)	Structures & Materials	51st Panel Meeting/Specialists' Meeting on a) Fatigue of Helicopters b) Boundary-Layer Effects on Unsteady Airloads
24-26 September	NETHERLANDS (The Hague)	Headquarters	16th Annual Meeting 49th National Delegates Board Meeting 29th Panel Chairmen Meeting
29 September- 3 October	UNITED STATES (Colorado Springs)	Fluid Dynamics	47th Panel Meeting/Symposium on Computation of Viscous-Inviscid Interactions
29 September- 3 October	ITALY (Turin)	Propulsion & Energetics	56th Panel Meeting/Symposium on Turbine Engine Testing
6-7 October	UNITED KINGDOM (London)	Guidance & Control	Lecture Series No.109 Fault Tolerance Design and Redundancy - Management Techniques
9-10 October	ITALY (Rome)	Guidance & Control	Lecture Series No.109 Fault Tolerance Design and Redundancy - Management Techniques
13-14 October	GREECE (Athens)	Guidance & Control	Lecture Series No.109 Fault Tolerance Design and Redundancy - Management Techniques
13-17 October	UNITED KINGDOM (London)	Guidance & Control	31st Panel Meeting/Symposium on Precision Positioning and Inertial Guidance Sensors; Technology and Operational Aspects (NATO-Confidential)

<i>Tentative Dates</i>	<i>Location</i>	<i>Panel</i>	<i>Type of Meeting/Subject</i>
13-14 October	GERMANY (Munich)	Technical Information	Lecture Series No.112 Patents - An Information Resource
16-17 October	NETHERLANDS (Delft)	Technical Information	Lecture Series No.112 Patents - An Information Resource
27-31 October	NORWAY (Geilo)	Flight Mechanics	57th Panel Meeting/Symposium on Subsystem Testing/Flight Test Instrumentation
27-31 October	ITALY (Naples)	Electromagnetic Wave Propagation	27th Panel Meeting/Symposium on Physical Basis of the Ionosphere in the Solar Terrestrial System
3-7 November	PORTUGAL (Lisbon)	Technical Information	33rd Panel Meeting/Specialists' Meeting on Information Services: Their Organization, Control and Use
12-14 November	BELGIUM (Brussels)	Aerospace Applications Studies Committee	Meeting No.19 - Review of Terms of Reference for Proposed AA Studies - Organization of Working Group for AAS 14 - Final Review for Study Group 12 - Initial Review for Study Group 13 (NATO-Secret)

TRADUCTION DES TITRES DES REUNIONS

Titles of Meetings

Titres des Réunions

Aerospace Medical Panel

- | | |
|--|--|
| – Aircrew Safety and Survivability | – La Sécurité et les Chances de Survie des Equipages Navigants |
| – Disorientation in Flight | – La Désorientation en Vol |
| – Long-Term Therapeutics and Prophylactic Measures for Aircrew | – Thérapeutique à Long Terme et Mesures Prophylactiques pour les Equipages Navigants |
| – Toxic Hazards in Aviation | – Les Dangers de Toxicité en Aviation |

Avionics Panel

- | | |
|---|---|
| – Electromagnetic Effects of Carbon Composite Materials upon Avionics Systems | – Les Effets Electromagnétiques des Matériaux Composites Contenant du Carbone sur les Systèmes Electroniques Aérospatiaux |
| – Image and Sensor Data Processing for Target Acquisition and Recognition | – Traitement des Images et des Données fournies par les Senseurs pour l'Acquisition et la Reconnaissance des Cibles |

Electromagnetic Wave Propagation Panel

- | | |
|--|---|
| – Propagation Effects in Space/Earth Paths | – La Base Physique des Effets de Propagation le long des Trajectoires Spatiales et Terrestres |
| – Physical Basis of the Ionosphere | – La Base Physique de l'Ionosphère |

Flight Mechanics Panel

- | | |
|---|--|
| – Design to Cost and Life Cycle Cost | – La Conception Economique et le Coût Total (LCC) |
| – Subsystem Testing/Flight Test Instrumentation | – Instrumentation d'Essais de Sous-Systèmes et d'Essais en Vol |

Fluid Dynamics Panel

- | | |
|---|--|
| – Subsonic-Transonic Configuration Aerodynamics | – L'Aérodynamique des Configurations Subsoniques-Transsoniques |
| – Computation of Viscous-Inviscid Interactions | – Les Interactions entre Ecoulements Visqueux et Non Visqueux |

Guidance and Control Panel

- | | |
|---|--|
| – Guidance and Control Aspects of Tactical Air-Launched Missiles | – Les Aspects de Guidage et Contrôle des Missiles Tactiques Aéroportés |
| – Precision Positioning and Inertial Guidance Sensors; Technology and Operational Aspects | – Technologie des Systèmes de Guidage Inertiel et des Systèmes de Détermination Précise de Position – Techniques de Filtrage – Etat Actuel et Développements Opérationnels |

Propulsion and Energetics Panel

- | | |
|--|---|
| – Testing and Measurement Techniques in Heat Transfer and Combustion | – Les Techniques d'Essais et de Mesures dans les Transferts Thermiques et la Combustion |
| – Centrifugal Compressors | – Les Compresseurs Centrifuges |
| – Turbine Engine Testing | – Les Essais de Turbomoteurs |

Titles of Meetings

Titres des Réunions

Structures and Materials Panel

- | | |
|--|---|
| – Effect of Service Environment on Composite Materials | – L'influence du Milieu Opérationnel sur les Matériaux Composites |
| – Boundary-Layer Effects on Unsteady Airloads | – Les Effets de la Couche Limite sur les Charges Aérodynamiques Instables |
| – Fatigue of Helicopters | – La Fatigue des Hélicoptères |

Technical Information Panel

- | | |
|---|--|
| – Information Services: Their Organization, Control and Use | – Les Services d'Information: leur Organisation, leur Contrôle et leur Utilisation |
|---|--|

Lecture Series

- | | |
|---|--|
| – Materials Coating Techniques | – Les Techniques d'Enrobage de Matériaux |
| – The Application of Design to Cost and Life Cycle Cost to Aircraft Engines | – La Méthodologie de la Conception Economique des Moteurs d'Avions |
| – Cryogenic Wind Tunnels | – Les Souffleries Cryogènes |
| – Aircraft Assessment and Acceptance Testing | – Essais d'Evaluation et de Réception des Avions |
| – Atmospheric Electricity/Aircraft Interaction | – Interactions entre Electricité Atmosphérique et Aéronefs |
| – Fault Tolerance Design and Redundancy – Management Techniques | – Conception Axée sur la Tolérance aux Défectuosités et Redondance – Techniques d'Exploitation |
| – Patents – An Information Resource | – Les Brevets en tant que Réserve d'Informations |

Aerospace Applications Studies Committee

- | | |
|------------------------------------|--|
| – AASC Meetings and Working Groups | – Réunions de l'AASC et Groupes de Travail |
|------------------------------------|--|

Project 2000

- | | |
|-------------------------|--------------------------------|
| – Review Board Meetings | – Réunions du Comité Directeur |
|-------------------------|--------------------------------|

Headquarters

- | | |
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| – AGARD Annual Meeting | – Réunion Annuelle de l'AGARD |
| – National Delegates Board Meetings | – Réunions du Conseil des Délégués Nationaux |
| – Steering Committee Meeting | – Réunion du Comité d'Orientation |
| – Panel Chairmen Meetings | – Réunions des Présidents de Panels |
| – National Coordinators Meeting | – Réunion des Coordonnateurs Nationaux |

PARIS PANORAMA

NEWLY-ANNOUNCED CHAIRMAN, Dr A M Lovelace, making the acquaintance of Brig. General Bentürk (Turkey) and his wife. On the left is the Turkish National Coordinator for AGARD, Colonel D. Kaya.



AVIONICS PANEL CHAIRMAN, Ir. H. A. T. Timmers, from the Dutch National Aerospace Laboratory, seen here with the Deputy Chairman of the Electromagnetic Wave Propagation Panel, Dr J. Aarons (United States).



A PARTING OF TWO colleagues and good friends. With the formalities over, AGARD Chairman, Frank Thurston, (right) gives a warm handshake to retiring Director, Robert Korkegi, at the end of his last National Delegates Board Meeting as Director of AGARD.

NATO FINANCIAL CONTROLLER Mr J. Ceulemans in conversation with a French colleague of many years, l'Ing. Général A. Vialatte, a former French National Delegate, at the reception held at the Cercle Militaire.



**PHOTOS FROM THE MEETING
OF THE AGARD NATIONAL DELEGATES BOARD — SPRING 1979**



FROM PATRAS UNIVERSITY, Greece, Professor V. Makios (centre) a National Delegate, enjoying the company of M.R. Willaume, the AGARD Director of Plans and Programmes, and U'Ing. Général P. Contensou (France).

*FLIGHT MECHANICS
PANEL Executive, Squadron
Leader Denis Stangroom's
return to the UK after a
three-year tour of duty in
Paris was marked by the
award of a certificate "in
recognition and appreciation
of services rendered".*



*RECENTLY RETURNED to the FRG is
Mr Jurgen Wild, of AGARD's Military
Committee Studies Division, here seen
with Major General P.B. Cavendish (UK)
of the International Military Staff at
NATO, a member of AGARD's Steering
Committee.*



*PROPULSION AND ENERGETICS
Panel Executive, Mr J. Krengel, and his
wife, now returned to the FRG after their
tour of duty in Paris, being greeted at the
AGARD Reception by the Director and
Mrs Korkegi.*

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